The invention relates to a device for a rail vehicle, and in particular, to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the next stopping point.

Page 1, between lines 28 and 29, please insert the following heading:

BACKGROUND OF THE INVENTION

Please replace the consecutive paragraphs beginning at line 29 of page 1 with the following rewritten paragraphs:

A device, described in US patent 5,239,472, is used to save travel energy on rail vehicles. This device has, as a control unit, a microprocessor which determines the distance between the rail vehicle and the next stopping point with a location measured value which is sensed by an odometer and with route data which is stored in storage means.

Furthermore, the microprocessor determines, with a measured time measured value which indicates the respective time, and with a predefined, stored timetable, the travel time remaining to the rail vehicle until it reaches the next stopping point. With the distance value and the remaining travel time, the microprocessor then calculates, while taking into account the respective travel speed and the coasting behavior of the rail vehicle, the point in time (referred to below as deactivation time) starting from which the rail vehicle can reach the next stopping point in non-driven fashion (i.e., by coasting or braking), while complying with the timetable.

An output device in the form of a display device is connected to the control unit. The display device is actuated by the control unit such that displaying the term "coast" signals a time which the drive of the rail vehicle can be switched off. In the device, the route data and the predefined timetable are transmitted to the rail vehicle by a track-mounted computing unit

before the rail vehicle is put into operation, and are permanently stored in said computing unit. The device is therefore an energy-saving device which saves energy by determining at what time the next stopping point can be reached in accordance with a timetable, and places the rail vehicle in a non-driven mode by utilizing the respective kinetic energy of the rail vehicle.

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Page 2, between lines 29 and 30, please insert the following headings and paragraphs:

SUMMARY OF THE INVENTION

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In one embodiment of the invention, there is a device of a rail vehicle. The device includes, for example, a computing unit which determines, in the rail vehicle, the distance between the rail vehicle and a stopping point using a measured location measuring value that specifies a location of the rail vehicle and predefined, stored route data travel time remaining to the stopping point using a measured time measuring value which specifies the time and a predefined stored timetable, and a deactivation time in the rail vehicle based at least partially on the distance determined, the remaining travel time determined, a speed measured value specifying the speed of the rail vehicle and predefined coasting data corresponding to coasting behavior of the rail vehicle when the drive is deactivated, starting from the deactivation time the rail vehicle reaches the stopping point according to the timetable, and an output device which is connected to the computing unit, generate a deactivation signal which specifies the deactivation time, wherein the device has a data input at which a timetable modification variable can be input into the device, and the computing unit is configured such that, when a timetable modification variable is input, a modified timetable is formed using the predefined, stored timetable and the timetable modification variable and determines the travel time remaining and the deactivation time based at least partially on the modified timetable, and the computing unit is configured such that it forms the modified

timetable by adding the timetable modification variable to each predefined time information item of the stored timetable.

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In another aspect of the invention, the computing unit is configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, during a downward transgression of which the rail vehicle is braked, driving travel toward the stopping point, in accordance with the predefined braking profile.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a device of the present invention used for a rail vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention relates to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the next stopping point. The device uses a measured location measured value specifying the location of the rail vehicle. Predefined, stored route data determines the remaining time to the next stopping point using a measured time measured value specifying the respective time. A predefined, stored timetable is also used to calculate a deactivation time, taking into account the distance value which is determined, the remaining travel time which is determined, a speed measured value which specifies the speed of the rail vehicle and predefined coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail vehicle promptly reaches, in a non-driven fashion, the next stopping point which is provided according to the timetable, while complying with the timetable, and an output device which is connected to the control unit, is actuated by it and generates a deactivation signal specifying the deactivation time.

Please replace the consecutive paragraphs beginning at line 30 of page 2 with the following rewritten paragraphs:

The invention discloses a device such that a reliable saving in travel energy can be achieved with it even when there are operating faults.

The invention has a data input at which a timetable modification variable can be input into the device, and the control unit is configured in such a way that, if a timetable modification variable is input, it forms a modified timetable with the predefined, stored timetable and the timetable modification variable which is input, and forms the remaining travel time and the deactivation time taking into account the modified timetable instead of the stored timetable.

An advantage of the device according to the invention is that the correct time is specified for switching off the drive, even if it is not possible to comply with the timetable owing to operational faults. For example, faults such as track faults such as "congestion" on the route or in the case of failures of vehicles etc. The device according to the invention has, in contrast to the known device, a data input at which a timetable modification variable can be input into the device. As a result, when there are operational faults, it is possible, for example, for timetable modifications to be input to the device by a track-mounted device, for example by radio. In order to process the timetable modification variable, the control unit of the device is configured such that it forms a modified timetable with the predefined stored timetable and the timetable modification variable which is input. The remaining travel time and the deactivation time of the drive are formed, taking into account the modified timetable. The device takes into account changes in the timetable by feeding into the device a corresponding timetable modification variable. Hence, in contrast to the known device, a

saving in travel energy can be reliably obtained with the device even when there are operational faults.

Another advantage of the device is that, in order to input the changes in the timetable, only one timetable modification variable has to be input into the device. It is therefore not necessary to transmit a complete new timetable to the rail vehicle or to the device according to the invention.

This will now be explained with reference to an example. If a fault has occurred on a route – for example as a result of congestion on the route – the originally stored timetable can, under certain circumstances, no longer be complied with and it must be replaced by a new timetable. Because a timetable comprises a multiplicity of data, and thus a large quantity of data, this large quantity of data would generally have to be transmitted to the rail vehicle so that the device or the control unit can determine the deactivation time of the drive taking into account this new timetable. In the device according to the invention, the transmission of a complete new timetable data record is, however, not necessary because only a timetable modification variable has to be transmitted to the device. If it is possible to calculate at the track end – for example in the case of congestion – that the timetable is shifted by a total of approximately $\Delta t = +10$ minutes, a track-mounted device is used, for example, to merely transmit a timetable modification variable of $\Delta t = +10$ minutes to the rail vehicle or to the device. A modified timetable is then formed in the device or in the control unit using the predefined, permanently stored timetable and the timetable modification variable of $\Delta t = +10$ minutes. The remaining travel time and the deactivation time for the drive is then formed in the control unit taking into account this modified timetable.

The modified timetable can be formed in the control unit by adding the timetable modification variable to each individual predefined time information item of the stored timetable. The timetable modification variable is added with the correct sign to the respective

predefined time information item of the stored timetable, ensuring that both changes to the timetable which bring about a prolongation of the travel time and changes to the timetable which cause a reduction in the travel time can be taken into account. This is significant, for example, if, contrary to the information specified in the stored timetable, the rail vehicle is to reach the next stopping point earlier than originally provided so that the route may be cleared earlier than planned.

In order to achieve overall short travel times of the rail vehicle, it is generally necessary to avoid the rail vehicle coming to a standstill by coasting to the stopping point. Coasting at a very low speed can, under certain circumstances, take a long time. For this reason, the rail vehicle is generally braked according to a predefined braking profile when it reaches a minimum speed. In order to allow for this, according to one aspect of the device according to the invention, there is provision for the control unit to be configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, on whose downward transgression the rail vehicle is braked in the phase of the non-driven travel toward the next stopping point in accordance with the predefined braking profile.

Figure 1 shows a device 5 for a rail vehicle (not illustrated) with a control unit 10 which is connected by its one input E10A to a measuring device 15. The measuring device 15 can be, for example, an odometer which determines the respective speed of the rail vehicle and the distance which has already been respectively covered, and thus the respective location S of the rail vehicle, using the revolutions of the wheels of the rail vehicle. At another input E10B of the control unit 10, a timer in the form of a clock 20 which transmits the respective time t as a time measured value to the control unit 10 is arranged upstream of the control unit 10.

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An additional input E10C of the control unit 10 is connected to storage 25 in which route data and a binding timetable for the rail vehicle are permanently stored. Furthermore, coasting data AD which describe the coasting behavior of the rail vehicle when the drive is deactivated are stored in the storage 25. This coasting data AD can be, for example, deceleration values which have been measured in advance when the rail vehicle coasts, that is to say when the drive is deactivated.

Please replace the consecutive paragraphs beginning at line 38 of page 6 with the following rewritten paragraphs:

The measuring device 15 and the clock 20 are interrogated with the control unit 10. A location measured value S specifying the respective location of the rail vehicle, a speed measured variable V specifying the respective speed of the rail vehicle and a time measured value t specifying the respective time are transmitted to the control unit 10 here.

The control unit 10 subsequently reads the location S0 of the next stopping point and a scheduled arrival time t0 from the storage 25 as route information or route data. The scheduled arrival time t0 specifies here the time at which the rail vehicle should have reached the next stopping point. In addition, the control unit 10 interrogates the coasting data AD stored in the storage 25.

The control unit 10 then tests whether a timetable modification variable Δt is present at its supplementary input E10D. The application of a timetable modification variable Δt to the supplementary input E10D can be carried out in different ways, with the result that the supplementary input E10D can be configured, for example, in such a way that a timetable modification variable Δt can be made electrically by means of a keypad input of the vehicle driver. Another method of inputting the timetable modification variable Δt could be for the timetable modification variable Δt to be fed into the computing unit 10 by radio – for

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example by means of a track-mounted device. This would then of course require corresponding receiving antennas at the supplementary input E10D of the computing unit.

Please replace the consecutive paragraphs beginning at line 38 of page 7 with the following rewritten paragraphs:

The control unit 10 subsequently forms a modified timetable by adding the timetable modification variable $\Delta t = + 10$ minutes to each individual predefined timetable information item stored in the storage 25. This addition will now be explained by reference to the example of the scheduled arrival time t0, with which a modified scheduled arrival time t0' is formed according to:

$t0' = t0 + \Delta t$

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Then, this modified scheduled arrival time t0', the location measured value S, the location S0 of the next stopping point, the speed V and the coasting data AD of the rail vehicle are used to determine a deactivation time from which the rail vehicle reaches the next stopping point with the drive deactivated by using its kinetic energy and while keeping to the modified timetable.

In order to achieve short travel times of the rail vehicle overall, it is generally necessary to avoid the rail vehicle coming to a standstill at the stopping point as a result of coasting. Under certain circumstances, coasting can take a long time at very low speeds. For this reason, the rail vehicle is generally braked in accordance with a predefined braking profile when a predefined minimum speed is downwardly transgressed. In order to allow for this fact, it is also possible to provide for the deactivation time in the computing unit 10 to be determined while additionally taking into account the predefined braking profile and the predetermined minimum speed.